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## DECREASING SCRATCH DEFECTS WITH QCC METHODS ON THE LINE ASSEMBLY FRAME OF THE MOTORCYCLE UNIT IN PT. XYZ

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### ABSTRACT

*PT.XYZ operates in the field of two-wheeled vehicle manufacturing. A product defect is produced in the design, namely scratch defect, which has an average defect percentage of 2.39%, which exceeds the Company's defect standard of 0.2%. This study aims to determine the factors that cause scratch defects and reduce scratch defects using the QCC method on the frame assembly line section. The research method is done with the stage starting from the problem identification stage to find out the problems that need improvement steps. Data collection techniques are done by conducting direct observations in the field and conducting interviews with related personnel as well as performing literature studies to learn the science of literature that has a direct relationship with the research topic. The problem formulation level is done to find out the main problems that are the source of the occurrence of defective products. Stages of activity collecting data obtained based on direct observation results and company defect data. The data processing stage was done using the QCC method with PDCA approach and using 5W + 1H stage for the repair process so that the defect value is 0.56%, in this case, there is a decrease in the percentage of a defect by 1.84% from the previous 2.39%. As well as giving a good quality influence on the products produced.*

### INTRODUCTION

The products produced by a company must meet standards and specifications that suit consumers' needs (Sritomo, 2006). In order to get greater profits, the number of products produced must be able to reach the sales target of products that the Company has already targeted (Kusuma,2014). Therefore, the quality of the products produced in the production

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process, starting from the machining process to the assembling process, must be monitored to prevent defective products can pass to the next stage of the process.

PT. XYZ is a company engaged in the field of two-wheeled manufacturing vehicles. The production phase in the frame assembly section starts from assy frame assembly, assy engine assembly, and spoke assy assembly with a maximum product defect rate of 0.2% of the number of products produced. In the assy frame, the assembly line includes the activity of assembling various components into one component frame unit. In assembly activities, there are still frequent product defects. The most common problems are scratch defects on the mainframe, brake handle, and rear arm. Production data in 2019, the number of scratch defects on the mainframe with a presentation of 1.81%, brake handle of 2.40%, rear arm of 2.96%, thus the level of scratch defects is still above the product defect tolerance limit that targeted companies.

To increase work productivity on the assembly frame, the Company needs to make remedial efforts in the series of production activities to reduce the level of product defects that can lead to rework processes that can lead to longer cycle time and waste that increases production increases, costs and increasing losses increased. Based on these conditions, it is necessary to research to determine the cause of scratch defects in reducing scratch defects by using the QCC (Quality Control Circle) method on the motorcycle unit's line assembly frame at PT. XYZ. QCC itself is one of the quality control methods used in solving problems in the Company related to product quality control (Riyanto, 2015). QCC is used to increase productivity (Khamaludin et al., 2019), Quality improvement (Slamet, 2019), improvement in reducing product defects (Dahniar, 2018)

## RESEARCH METHOD

This study uses the QCC (Quality Control Circle) method to reduce scratch defects in the frame assembly line. The steps taken in this study are:

### A. Preliminary Observations

The initial stage conducted in this study is a direct observation to the Company to see, understand, and record the process in the assembly line to know the type of product made, which produces product defects in excess of the Company's standards. The product defect that occurs is a scratch defect on the assembly part of the skeleton. So far, what are the factors that have caused the product defects so far?

### B. Problem Identification

After making a visit or direct observation, then the next step is to identify the problems found in the Company where it can be determined that the formulation of the problem of this problem is (1) any factors that cause scratch defects and (2) how to reduce scratch smallpox found in the assembly frame.

### C. Data Collection Techniques

The object of observation activity is the condition of assembling line frame assy activity, number and type of defects, the performance of machine operator, and prescribed work procedures. Data collection techniques include:

1. Primary data
  - a. Observation: data collection performed by direct observation in assembling activities.
  - b. Interview: data and information obtained by conducting direct communication with leaders and operators as well as to other parties involved in assembling activities.
2. Secondary Data
  - a. Production data in line assembling frame assy from October 2019 - March 2020
  - b. Data defect in line assembling frame assy.

### D. Data processing

All data obtained will be processed using the QCC method with the PDCA approach in the process of improvement.

All data obtained will be processed using the QCC method with the PDCA approach in the improvement process. As for the stages:

1. Plan :  
Determine the theme and analyze the situation, set a target, cause factor analysis and find the source of the cause, looking for ideas and improvement plans
2. Do  
Implementation of the improvement plan
3. Check  
Evaluation of improvement results
4. Action  
Standardization and Prevention plan.

Stages of analysis and discussion to determine the extent to which quality improvement activities have been done can lower the defective scratch products on the line assembly frame.

## RESULTS AND DISCUSSION

In the process of assembling a motorcycle, three components often suffer from scratch defects, namely the mainframe, brake handle, and rear arm. The presence of defects in the assembly process will affect the quality of the product produced, so quality improvement actions are needed to reduce the level of scratch defects using the QCC method.

Where can the eight steps of QCC in solving the ongoing problems be poured into the PDCA cycle? The relationship between the PDCA cycle and 8 QCC steps in reducing scratch product defects in assembling line frame assy,

### A. Plan

The number of scratch defects that occur in the assembling process is above the product defect level target allowed by the Company by 0.2%. Based on these conditions, the QCC team set a target of quality improvement activities to reduce the level of scratch defects by analyzing the problem based on causal factors. Figure 1 provides information on the value of scratch defects that occur. Figure 1 provides information on the percentage of defects that occur during the observation

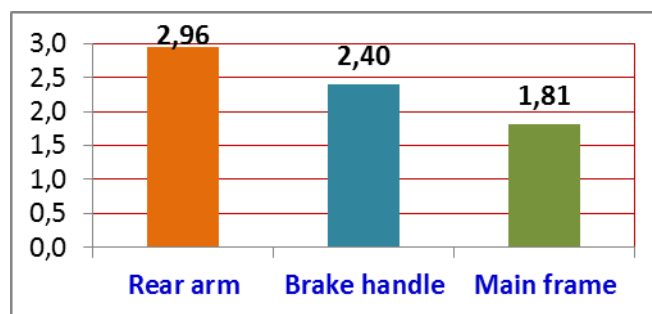


Figure 1. Diagram Scratch Defect

The cause of scratch defects from factor (1) human beings that are inexperienced operators cause operators to be less reliable in solving a problem online, thus causing many Not Good items made and already installed on motorcycles. The cause of scratch defects forms factor (2) of the machine is the jig holder's position that is easy to shift. Jig made of plastic material makes it easy to wear when installing the handle. The cause of scratch defects forms factor (3) method that is in the installation of the master cylinder to the handle is done by not tilting the bolts first because there are no latest working instructions and there is still no working method to do adjuster chain so as not to touch the rear arm. The cause of scratch defects form factor (4) material is the jig holder used for the process of assembly material made of plastic material. Its use is easy to shift and the condition is quickly damaged or worn in some parts can cause scratch defects.

The results of identifying causal factors performed through analysis using the cause and effect diagram, then do a more detailed analysis with the 5W + 1H method used to decide the remedial action to be taken by finding alternative solutions to reduce the level of scratch defects. Results by analysis in the following table 1 below.







Table 1. Analysis of the causes of scratch defects with the 5W + 1H method


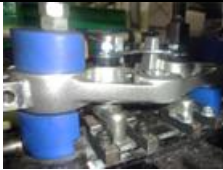




Defect	What	Who	Where	When	Why	How
<i>Mainframe scratch</i>	Scratches on the surface of the mainframe	Operator	<i>line assembly</i>	Sept-Des 2019	Tools used are too short	Design tool changes with longer ones
					There is no bolt mounting protector	Make a protector of the engine bracket assembly process
<i>Brake handle scratch</i>	Scratches on the surface of the paint brake handle	Operator	<i>line assembly</i>	Sept-Des 2019	The surface of the paint is exposed to the friction of the cylinder	unit Changes in the way the cylinder unit is installed
					Jig holder is easy to shift	Modify jig holder equipment
<i>Rear arm scratch</i>	Scratches on the surface of the rear arm paint	Operator	<i>line assembly</i>	Sept-Des 2019	Jig stands are often damaged	Perform routine maintenance activities
					The adjuster chain assembly scratches the rear arm surface	Modify the adjuster chain installation protector

## B. DO

At this stage, there is the 5th stage of QCC, which is implementing the improvement plan. Where the results of the improvements can be seen in Table 2 below:

Table 2. Implementation of Quality Improvement

No	Installation	Before repairs	After repairs	Corrective Action
1	<i>Bracket engine</i>			Adds a protective interval that can be installed and removed.
2	<i>Tube fuel tank</i>			Adds a protective interval that can be installed and removed.
3	<i>Brake handle</i>			Loosen the bolts on the master cylinder before installation

No	Installation	Before repairs	After repairs	Corrective Action
4	Stopper brake handle			Make a jig for the stopper brake handle from the iron plate material.
5	Rear arm			Adds a mica foam protector to the wheel assembly
6	adjuster chain			Adds protection to the adjuster chain installation

### C. Check

At this stage, there is the 6th stage of QCC, which evaluates the improvement results, where the results of the improvements can be seen in table 3.

Table 3. Scratch defect level comparison

No	Defect <i>scratch</i>	Before Repair (%)	After Repair (%)	Percentage Decrease (%)
1	Rear arm	2.96	0.56	81.08
2	Brake handle	2.40	0.67	72.08
3	Main frame	1.81	0.45	75.14

A comparison of scratch defect results in the assembly process before and after repairs can be seen in the following figure 2.

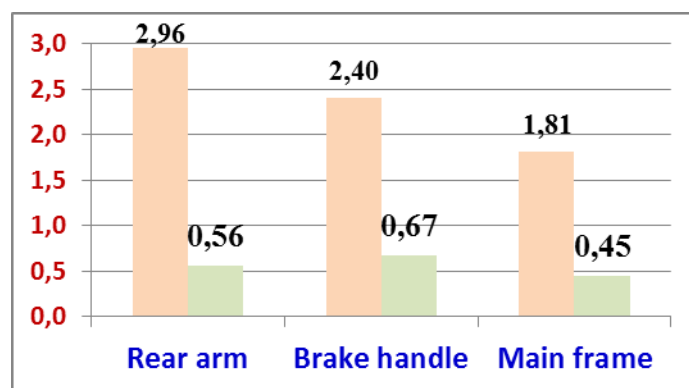


Figure 2. Scratch defect level comparison

#### D. Action

There are two final stages of QCC, namely standardization, and the following interventions and plan to set. The Standardization stage (Action) is done by setting the standardization of work methods in the assembly process to the mainframe by making a protector on the mainframe pipe to reduce the occurrence of scratches caused by friction between equipment and clamp pliers during the installation of engine brackets and fuel tank tubes. To break the handle by making changes to the way the work is done by loosening the bolts first in the installation process to reduce scratches between the master cylinder and the handle. For the rear arm, improvements are made by adding a protector in the rear brake and adjuster chain installation process to avoid friction that can cause scratching on the rear brake.

The next plan in reducing the defects of scratch products is by making continuous improvements from the improvements that have been given and applied, where scheduling for operator training in sharpening in adding insight into the tools they use, scheduling for checking the tools used, and more.

#### CONCLUSIONS

Based on the results of the quality improvement action analysis that has been done by the QCC team, it can be concluded as follows: (1) Factors that cause scratch defects in the most dominant frame assembling line due to human error factors and equipment factors that are easy to shift and easily damaged. Another factor comes from the method factor because there is still no change in the latest work instructions to adapt to the type of motorcycle currently in production. While material and environmental factors influence the occurrence of scratch defects but not significantly, and (2) Quality improvement with the QCC method obtained results for the level of scratch defects in the mainframe decreased by 0.56%. The value of defects obtained after repairs is close to the Company's standard of 0.2%.

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